Pricing behaviour in the Polish pork market during transition

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Cahiers d'économie et sociologie rurales, n° 71, 2004

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Formation des prix sur le marché du porc polonais pendant la transition

Résumé – Cet article étudie la différenciation des prix sur le marché du porc polonais. Issues de considérations théoriques, les hypothèses formulées sur le comportement des entreprises sont évaluées dans le cadre d'une analyse économétrique utilisant des données de groupes équilibrées sur les prix hebdomadaires des produits du porc et des entreprises de transformation de viande, durant la période 1991-1998. Les résultats empiriques prouvent que les prix sont sensiblement influencés par les coûts de production et le degré de concurrence entre les entreprises de transformation de viande. Ils montrent également que la stratégie de conduite des coûts, ainsi que la différenciation verticale et horizontale des produits sont des phénomènes importants sur le marché étudié. Enfin, ces résultats confirment indirectement certaines considérations théoriques suggérant que sur les marchés oligopolistiques les entreprises suivent différentes stratégies de vente afin de résister à la pression de la concurrence et, en conséquence, d'augmenter leur efficacité économique.

Mots-clés :
formation des prix, structure du marché, qualité du produit

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Summary *– This study deals with price differentiation in the Polish pork market. The hypotheses about firms' behaviour are derived from theoretical considerations and tested in an econometric analysis using balanced panel data of weekly prices for pork products and selected companies between 1991 and 1998. The empirical findings show that prices are significantly influenced by production costs and the degree of competition among meat processors. In addition, the results suggest that cost leadership strategy, as well as vertical and horizontal product differentiation, are relevant phenomena in the market under investigation. The findings indirectly confirm theoretical considerations suggesting that in oligopolistic markets, firms follow different marketing strategies in order to withstand competitive pressure, and hence to increase their economic efficiency.*

Key-words:
pricing, market structure, product quality

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IN a command economy, enterprises have only limited possibilities to establish a consumer-oriented marketing system. Central planning governs the amount of raw materials purchased from upstream branches as well as the set of processed goods provided for final consumption. Furthermore, transfer prices and trading partners are also determined by the central planning agency. Under these conditions, there are only limited possibilities for the development of market forces. As a result, the final consumers suffer from inappropriate supply composition, low product quality and limited availability of regional specialities.

The transition from a command to a market economy demands that enterprises drastically reorient themselves. A necessary condition is that they update their production and processing facilities in order to be competitive on national and/or international markets. Furthermore, firms have to explore the markets and restructure their production and marketing activities according to consumer preferences and competitive pressures.

The objective of our paper is to analyse to what extent processors in the Polish pork industry have been able to implement price differentiation strategies. Our basic proposal is that this activity can be detected from cost differentials among firms. Thus, in the first step, we develop testable hypotheses regarding the formation of prices. The second step consists of identifying determinants of this strategy in an empirical analysis.

The paper is organised as follows: the next section deals with relevant developments in the Polish meat industry during transition. Another one aims to derive comparative static results to be tested in the empirical analysis. The two following sections analyse major elements considered to be relevant for explaining existing price differentials between meat processing firms over time. To test these hypotheses, we use data from the pork processing firms in Poland. We choose three categories of pig meat products: (1) fresh meat (FM): pork chop and pork shoulder, (2) highly processed pork products with a high share of raw materials (PH): cooked ham and cured loin, and (3) sausages that are highly processed meat products with a relatively low share of pig meat (PL): frankfurter, and a kind of hard cured sausage[1]. The period under investigation covers 1991-1998. The final section draws some general conclusions.

THE POLISH MEAT INDUSTRY DURING TRANSITION

The transition process has changed the Polish meat market dramatically. Not only were former state-owned enterprises privatised, but new enterprises were also founded. The growing number of firms in the

[1] The traditional Polish names of these two sausages are: parówki (frankfurter) and kiełbasa zwyczajna (a kind of hard cured sausage). For details concerning the internal product attributes, see BN-84/80144-05 (1988), PN-A-82007 (1996), Fellows (2000).

sector, the implementation of new efficiency-oriented incentive schemes and the growing awareness of consumer sovereignty have led to more intense competition among the firms. As a producer market transformed into a consumer market, changes in consumer preferences and the increasing degree of competition have obliged the formerly state-owned enterprises to modify their production profile. As a result, some of them today manufacture between 300 and 500 different meat products, whereas products that did not meet consumer preferences have left the market. In addition, market transparency is expected to be relatively high, because consumers can compare prices at different locations (stores) relatively easily (Pieniadz, 2002). Given that firms should supply homogenous goods, these characteristics should lead to similar product prices for all firms.

The figures presented in table 1 show that on average, about 45% of the price variations are due to between-firm variance. The magnitude of this phenomenon varies among products, but is present in all production lines. This indicates that firms are able to use marketing practices that allow them to overcome the negative impacts of price competition on the remuneration of their resources.

Table 1. **Variance decomposition of real product prices***

Product group	Output prices	σ_T	Share of σ_W	Share of σ_B
FM	Pork chop	0.0364	61.9	38.1
	Pork shoulder	0.0451	55.2	44.8
PL	Hard cured sausage	0.0332	56.3	43.7
	Frankfurter	0.0401	47.8	52.2
PH	Cooked ham	0.1335	54.6	45.4
	Cured loin	0.2238	55.0	45.0

* Deflated by average price development, base 2nd quarter 1991. The data reflect the processors' weekly quotations from 2nd quarter 1991 to 2nd quarter 1998.

Notes: σ_T*: total variance* (= $\sigma_W + \sigma_B$); σ_W: variance within a firm; σ_B: variance between the firms.

Sources: own calculations based on PISiPAR-database (1998) and Menges (1982).

THEORETICAL BACKGROUND

Models of pricing behaviour in oligopolistic markets

In the following, we present some theoretical considerations, which constitute the base of our empirical model. Our intention is to derive basic hypotheses regarding the formation of prices, rather than going into detailed modelling. In all approaches mentioned below, the price is

the central decision variable. We will start with an examination of pure Bertrand competition. The analysis will be extended by embedding product differentiation and price discrimination.

Pure Bertrand Competition

Suppose that there are two firms with unconstrained capacity and identical per unit production costs ($c_1 = c_2$). Both firms consider prices as strategic variables. Market demand is given by $D(p, \theta)$, where p and θ represent prices and a parameter vector, respectively. The Bertrand Paradox states that there is a unique equilibrium in which firms choose $p = c_1 = c_2$ (Tirole, 1994). Thus, profits are zero and prices are fully determined by the production costs. However, the assumption of equal production costs can be relaxed: provided that $c_1 < c_2$, the firm with lower production costs will capture the entire market and charge a price marginally below c_2, which then causes a competitive threat to the high cost firm. Accordingly,

$$p = \max\{c_1, c_2\}.$$

If the model is extended to include increasing marginal costs[2], prices are the same for all firms and depend on the parameters of the demand function and the cost of all producers:

$$p^B = p(c_1, c_2, \theta). \qquad (1)$$

The Bertrand model specifies determinants of a common price, however it cannot explain price differentials. Nonetheless, the preceding discussion offers two important results: first, if an industry produces a homogeneous good, the possibilities to use marketing activities are rather limited. In such cases, sufficient income remuneration can be achieved by pursuing a cost leadership strategy. Generally, cost reduction leads to an under-proportional decrease of equilibrium prices. Second, if a firm reduces its costs, the competitive pressure caused by other enterprises will be lower, and the firm will be able to extend its market share. Both effects provide an increase of profits.

Often, the determination of such equilibria involves mixed strategies, which appear unreasonable in a static pricing framework[3]. In order to avoid this problem, more realistic approaches to firm pricing behaviour have been developed. In oligopolistic markets, enterprises possess possibilities to increase their profits by product differentiation and price discrimination.

[2] In the following considerations, c_1 and c_2 are functions of production quantity. In order to keep our treatment simple, we will not denote this relationship explicitly.

[3] Tirole (1994) argues that *ex post facto* (*i.e.*, after learning of competitors' prices), a firm has to adjust its price. Thus, in a mixed strategy equilibria, dynamic pricing mechanisms have to be considered, a result which is inconsistent in a static pricing model.

Product differentiation

Product differentiation refers to a situation in which consumers perceive two or more goods as close, but not perfect, substitutes. One product can be made distinguishable from others by using various marketing instruments (*i.e.*, price), by offering different sets of product attributes (ingredients, taste, texture), or by projecting different product images and personalities (George *et al.*, 1992; Hay and Morris, 1991).

Products can be differentiated horizontally and vertically. **Horizontal product differentiation** means that, in the extreme case, every consumer has their own valuation of the products' characteristics[4]. The traditional reference to horizontal product differentiation is Hotelling (1929). In the basic model, two firms with a given position or given product attributes η_i are considered, where $i = 1, 2$. Consumers are located uniformly within a linear city, and decide from which of the two firms to purchase. Let total demand be given by $D(p, \theta, \eta)$. Accordingly, consumers' choice depends on product prices and their preferences are revealed by their transportation costs or desirable product properties. Under these assumptions, there exists a unique Nash equilibrium in which both firms charge the same price:

$$p^H = p(c_1, c_2, \theta, \eta_1, \eta_2) > p^B. \tag{2}$$

Due to the inclusion of η_i in the price equation, the impact of non-cost components on prices increases. Moreover, the more differentiated the products are, the higher the prices and profits will be. Thus, if firms can choose their location, they will move as far apart from each other as possible to reduce the competitive threat.

Vertical product differentiation refers to a set of products ordered according to their attributes, over which consumers share common preferences. For example, two essentially identical products with different qualities are considered to be vertically differentiated[5]. Individual demand is assumed to be $D(p, \theta, \omega)$, where ω represents product quality. In general, vertical product differentiation is modelled by assuming that there is a positive correlation between consumers' income and the demand for higher product quality. Due to income disparities among consumers, a demand for goods of different qualities exists. If this condition is satisfied, firms have incentives to provide either high (ω_1) or low (ω_2) quality products. The equilibrium is characterised by firm specific prices with p_1^v and p_2^v for the high and low quality producers, respectively:

$$p_i^v = p(c_1, c_2, \theta, \omega_1, \omega_2), \tag{3}$$

with $i = 1, 2$ and $p_1^v > p_2^v > p^B$.

[4] Examples of horizontal differentiated products are Pepsi and Coke.

[5] For example, inferior *vs* superior products (*i.e.*, brand-name *vs* generic products).

Similar to the former case, vertical product differentiation allows a firm to overcome competition, and hence to extract more of the consumer surplus than without product differentiation. Moreover, since profits are an increasing function of quality differences, establishments tend to differentiate as much as possible.

Price discrimination

This pricing behaviour can be defined as charging different prices to various buyers of a homogeneous good (Tirole, 1994). The differential pricing may be enforced by using several instruments, including non-linear tariffs, *i.e.*, quantity discounts (ξ), and price schedules targeted to the characteristics of the consumer (χ). The latter contain different customer price elasticities, duration of business partnership, etc. Thus, the output price can be described by the following function:

$$p_i^D = p(c_1, c_2, \theta, \chi, \xi).$$

As opposed to product differentiation, which could be interpreted as a long-run adjustment to a stable price equilibrium, price discrimination leads to a short-run fluctuation of prices. Thus, it has to be assumed that at different points in time t and τ,

$$p_{it}^D \neq p_{i\tau}^D \qquad (4)$$

provided the attitudes of demand vary over time. Similar to product differentiation, price discrimination can be seen as a mean of reducing the influence of competition and improving the firms' economic efficiency. In the short run, it is likely that the average output price is lower than without discrimination. On the other hand, the instruments assist in building long-run relationships with customers, which can help to maintain or even expand market shares and to reach the sustainable development of future profits[6].

Motivation of the regression procedure

Depending on the demand function and firm characteristics, it can be expected that prices are determined by a non-linear relationship between the various factors. However, as an approximation, a linear

[6] For price discrimination to be possible, some conditions must be met (Hay and Morris, 1991). First, the firm must have some monopoly power, at least as far regional markets are considered. Second, it must be possible for the firm to identify in its market either customers with different reservation prices or segments of the market with different demand elasticities. The first condition is very likely to be satisfied during the investigated period, whereas the second might not have been due to the dynamic changes of retail trade and final demand during transition, which led to high information and search costs.

relationship can be chosen. Given the panel nature of our sample for firm i and period t we assume that:

$$p_{it} = \Delta(\eta) + \Delta_i(\omega) + \Delta_{it}(\chi, \xi) + \beta_0 + \beta_{1-} c_{1it} + \beta_{2-} c_{2it} + \varepsilon_{it}, \qquad (5)$$

with $\varepsilon_{it} \sim N(0, \sigma^2)$.

Here, c_{1it} is a vector of k exogenous variable representing a firm's own costs, including success in pursuing a cost leadership strategy, whereas c_{2it} indicates further cost variables related to the competitive market threat. The error term ε_{it} denotes the effects of all remaining omitted variables that are peculiar to both the cross-sectional units and time periods. In line with the oligopoly models, we assume that both parameter β_1 and β_2 are greater than zero. The $\Delta(\bullet)$ represent the impact of horizontal and vertical product differentiation, as well as price discrimination on output prices.

To take account of heterogeneity across analysed firms we preferred fitting equation (5) by variable-intercept model (Hsiao, 1996; Mátyás and Sevestre, 1996). Unfortunately, in its actual form it is not suitable for estimation. This led us to consider a modified form of (5) to overcome the identification problems impeding its solution.

The first problem arises from the fact that we do not have data which allow a separation of $\Delta(\eta)$ and β_0. Thus, the overall constant term includes both influences. However, the discussion of (2) provides that horizontal product differentiation will reduce the impact of c_{1it} and c_{2it} on prices. Thus, a generic intercept close to the average price can be taken as an indication that horizontal product differentiation is a relevant phenomenon.

A further problem results from treating the impact of vertical product differentiation as a firm-specific variable only. In fact, firms differentiate their products through time in response to changing consumer preferences. Thus, the variable product differentiation tends to also have a temporary dimension. However, even though we have a detailed data set, it provides no exact information regarding the quality attributes of the sold products. A part of the price variation due to vertical product differentiation can be captured by some firm and time-varying variables, especially input prices, since there is a verifiable correlation between prices for high quality outputs and inputs. These outlined circumstances may limit the relevance of firm-specific effects and increase the residual price variation as far as vertical product differentiation is considered. At the same time individual differences among firms might be caused by a multitude of other individual and time-varying factors that are not included in our data set. The effects of the omitted variable, which vary between firms but stay constant through time, *i.e.*, managerial or technical differences among firms, will be absorbed into the firm-specific intercept. This suggests a further modi-

fication need of (5), and thus a caution by the interpretation of the estimated firm-specific effects.

A third difficulty results from the inclusion of discriminating pricing schedules. We could partly resolve this by considering basic output prices at the firm gate level. Thus, the analysed price variation could not have been affected by departing from the basic price, since it is practised at a later distribution stage. Nevertheless, an estimation bias can still arise when comparing the output prices over time, because price discrimination is supposed to have short-time effects on the overall price variation: during the investigated period in Poland, pronounced quantity and price adjustments to seasonal demand, especially during holidays such as Christmas and Easter have been observed. However, the only firm-specific information possibly related to price discrimination over time we have is the total amount of sales of a given product in a period, but not the price of the individual transactions within this sale. Attempts to include a proxy variable for price discrimination, such as the firm-specific share of total industry sales at a given point in time, have not been successful. This leads us to restrain from considering price discrimination in the estimated model. Furthermore, the implementation of seasonal dummies to lessen the problem of this omitted variable has not led to significant results. Consequently, non-inclusion of price discrimination in the explanatory part is expected to reduce the explanatory power of our model. This disadvantage may be amplified by the effects of other omitted individual-time varying variables.

Additionally, it is well known that some non-observable factors included in the error term might affect all, or part, of the firms at the same time, giving the rise to a non-zero contemporaneous covariance between the disturbance of two different firms. In order to take account of the possible temporal relationships of the error terms we considered some extensions of our model: the estimates have not turned out to be very promising, since the coefficients of autocorrelation were not significant at the usual levels[7]. However, we correct the Gauss-Markov assumptions for an unknown form of panel heteroscedasticity since, while estimating by OLS, the variances of the residual were not equal among firms.

The preceding discussion provides that we estimate a functional relationship in the following form:

[7] Due to the construction of the dependent variable, we have eliminated price variations resulting from common trends like inflation and price adjustment to changing demand and supply conditions. Thus, we do not need to include a common trend in our model. See the comments in section "Dependent variable".

$$p_{it} = \Delta^*(\eta) + \Delta_i^*(\omega) + \beta_{1\text{-}}\, c_{1it} + \beta_{2\text{-}}\, c_{2it} + \varepsilon^*_{it}$$

with $$\Delta^*(\eta) = \beta_o + \Delta(\eta) \qquad (6)$$

$$\Delta_i^*(\omega) = \Delta_i(\omega) + \Delta_i(\mu)$$

with μ being a sum of other firm-specific effects

$$\varepsilon^*_{it} = \varepsilon_{it} + \Delta_{it}(\chi, \xi).$$

Furthermore, $\varepsilon^*_{it} \sim N(0, \Sigma^*)$, with $\Sigma^* = \Sigma \otimes I$, where Σ represents a diagonal matrix with elements σ^2_{it}.

This model can be estimated depending upon whether the variable intercept, $\Delta_i^*(\omega)$, is assumed to be random or fixed (Baltagi, 1996; Greene, 2000; Hsiao, 1996; Judge *et al.*, 1985). The random-effect estimator requires that the firm specific effects, $\Delta_i^*(\omega)$ and the explanatory variables, $c_{.it}$ be uncorrelated. We checked the appropriateness of this specification for all products using a Hausmann (1978) test. The test statistics suggested links between $\Delta_i^*(\omega)$ and $c_{.it}$, for all products. Since ignoring this correlation would have led to biased estimation while using random-effect estimator, a fixed effect estimator was fitted[8].

Each processor supplies a wide range of products where the production bundle is influenced by price relations as well as technological restrictions. Thus, there are strong linkages to the amount of production in the different product categories. In addition, it can be expected that this in turn has consequences for a firm's pricing behaviour. The interdependencies between products would be explicitly considered in the variance co-variance matrix of the error terms. This suggests that (6) should be estimated using seemingly unrelated regression techniques (SURE) in order to increase the efficiency of the estimates. However, the same set of regressors is used in each price equation. Under this condition the consideration of the co-variances among a firm's price equation provides no efficiency gains, *i.e.*, the results of OLS and GLS are the same (Greene, 2000). Thus, because there is no theoretical reason for using SURE, the price equations for each product are estimated separately.

DATA SET

Structure of the sample

The hypotheses about pricing behaviour have been tested using data for the Polish meat market. We combined information from several sources. Our main set contains data on product prices and quantities, as

[8] The reasons for this finding are not surprising, since it is very likely that firms costs are affected by unobservable managerial skills or technical differences among firms.

well as purchase prices for pigs from selected Polish meat processors. This information was provided by the governmental 'Control Agency for Procurement and Processing of Agricultural Products' (PISiPAR). Data from 45 firms, with complete records for the whole period between the second quarter of 1991 and the second quarter of 1998, were used. Since the identity of the individual firms was known, additional information from other sources could be included. These are the location of each firm, its ownership status, whether a license to export meat products into the European Union (EU) is possessed, etc.

The focus of the study is on the largest firms in the meat processing industry. The enterprises were considered, by the control agency, to be able to influence prices on the Polish meat market[9]. Therefore, not all slaughtering and meat processing establishments are included in the data set. Hence, due to the selection procedure, the investigated sample is neither random nor representative for the Polish meat industry. In 1991, the 45 analysed firms accounted for around 70% of total sales and around 75% of employment in the meat sector. The corresponding figures for 1997 were 40% and 53%, respectively. All of these firms were state-owned until 1989, and had been almost completely privatised by the end of 1998. A typical firm in the sample processes pork (around 70%) and beef (30%). Another feature of the firms is their high degree of horizontal and vertical integration. The technological process embraces slaughter, partition and production of meat products. Moreover, upstream relationships are being developed through involvement of meat processors in livestock production (contractual control over livestock supply) as well. A typical meat-processing firm in the database is forward integrated and sells 30% of its produce through its own wholesale and retail distribution system[10].

Dependent variable

The variable to be explained is price variation for different meat products, as they are quoted weekly by the processors. The available series mirrors the prices at the firm gate. These differ from those paid by consumers since margins set by wholesalers and retailers are not included. For some observations no data were available. In order to get a complete record for the processors, we calculated quarterly averages of individual product prices.

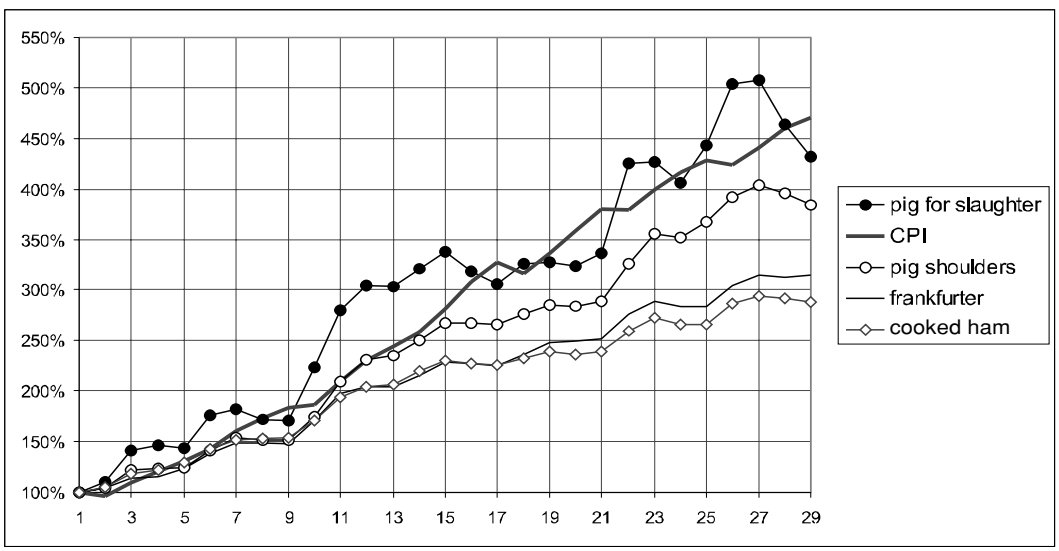
[9] The agency surveys these firms every week and receives firm-specific information about quantities and prices of purchased inputs (livestock/carcasses) and marketed output (detailed intermediate and final products).

[10] Own calculations based on PISiPAR-database (1998), Boss (1998), GUS (1992 a, 1998 b), IERiGZ (various issues), MSP (1991), Individual Annual Reports of the meat processing firms and information collected at the Treasury Ministry in Warsaw, Poland, and interviews with representatives of the investigated firms.

Price movements on the Polish hog/pork markets reflected not only the macroeconomic changes (inflation), but also dynamic adjustment processes on the whole meat market (*i.e.*, market integration). Driven by cyclic fluctuations of pork and beef supply, the development of competition among meat processors, and changing consumer preferences, the behaviour of the average purchase and product prices diverge from that of the common deflators, *e.g.*, the consumer price index (CPI) (figure 1). For this reason, we avoid adjusting the nominal time series by using common aggregated deflators. Instead, we proceeded by calculating the average price in each quarter for each investigated product and using this figure for deflating the price series. Thus, the dependent variable measures a firm-specific price for a given product relative to an average for all firms for that product in that quarter.

This procedure allows us to abstract from factors that simultaneously affect all prices through time, but are the same for all cross-sectional units at a given point in time (inflation, cyclic changes of pig supply, etc.).

Figure 1. **Nominal price movements on hog/pork markets and the development of the consumer price index (CPI) for food products in Poland between the 2nd quarter 1991 and the 2nd quarter 1998**



Source: own calculations based on PIS\PAR-database, and GUS (various issues d).

Independent variables

According to theoretical considerations, higher costs are associated with higher prices. Unfortunately, the data set does not provide any accurate information about the firms' costs. Thus, we have used different proxy variables to account for this effect on price variation. As men-

tioned in the theoretical part, the variable c_{1it} represents firm's own costs; it contains production, transport and transaction costs.

Regarding transaction costs, we concentrate on ownership structure. We presume that the privatisation of former state-owned enterprises (SOE) has a positive impact on allocative efficiency. Thus, privatisation is assumed to reduce overall firms' costs and in turn to induce lower output prices. The reasons for the efficiency gains differ in nature. First, following the arguments of the new institutional economics (Furubotn and Richter, 1998), in privatised firms, more efficient incentive schemes can be implemented and enforced. Second, owners and managers are forced to work under hard budget constraints (Kornai, 1979). On the other hand, since the "new" corporate governance structure is associated with the applied privatisation method, different degrees and forms of firm restructuring, and hence, various efficiency gains among them, can be expected. For this reason, we differentiate among the privatisation methods in further analysis[11]. Information on the privatisation method was coded in three binary dummy variables, all of which differ among the firms and over quarters: the variable "Indirect privatisation" denotes that a firm was converted first from an SOE into a wholly state-owned joint stock company. Afterwards, the shares were distributed by initial public offering, public tenders, or other ways. The variable "Direct privatisation" indicates that a firm has been privatised by leasing and/or by selling[12]. Membership in one of the National Investment Funds represents the third main privatisation strategy in Poland: this method is symbolised by the variable "Mass privatisation"[13]. Since in many cases the privatisation process exceeded one quarter, each of the dummy variables take on the value 1 when the privatisation process by a firm has been entirely accomplished. Some summary statistics showing changes during the investigated time period are presented in table 2.

[11] For more details on privatisation methods in the Polish food industry, see Pieniadz (2002) and Bornstein (1999).

[12] The ownership change through direct privatisation in Poland is similar to management and employee buy-outs strategy (MEBO), which can be found in Western countries. In Poland, this kind of privatisation consists of the liquidation of a solvent SOE by leasing, selling or otherwise 'contributing' its assets to a new company. Although its assets remain and its operation continues, the enterprise's legal status changes from an SOE to a private firm. According to this dummy variable, the database contains only firms which have been privatised or 'liquidated' by leasing and by selling.

[13] The NIF-program, involving 512 companies from various branches, consisted of setting 15 investment trusts called National Investment Funds (NIFs), managed mainly by various international and domestic financial firms, insurance and/or industrial firms, whose remuneration was closely linked to their ability to successfully turn around and eventually sell the enterprises in their portfolio. After the allocation of the firms to the 15 NIFs (1995), freely tradable master share certificates representing proportional ownership in the 15 NIFs were distributed to Polish adult citizens. Subsequently, the certificates could have been exchanged for one separate freely tradable share in each of the NIFs. Mass privatisation was fully implemented by the end of 1997.

Differences in the fixed costs of production are approximated by two dummy variables, "Affiliation with a capital group" and "Possession of an export licence". While considering an "affiliation with a capital group", different factors driving the costs in counteracting directions should first be discussed: on the one hand, firms that belong to a capital group have better access to investment capital from within-group sources. Since the investigated period was characterised by high real interests and low profitability of the meat-processing sector, investments based on own capital should have led to comparative advantages as far as financial costs are concerned. In the long run, additional investment raises productivity and hence reduces overall production costs. Furthermore, firms within a co-operating group can exploit economies of scale and scope, and thus reduce R&D and marketing expenditure even further. However, this is more likely to be the case within well-established capital groups. In fact, during the investigated period the development of different market-oriented hierarchical structures had already started. The additional costs of establishing groups in the market could have been further amplified by intense price competition on the Polish meat market. To overcome their rivals, group members have been continuously searching for new promotional and advertising strategies for domestic and export markets, as well as possibilities to differentiate their products (*i.e.*, developing trademarks). These activities tend to increase the expenditure of the considered firm in the short term. Additionally, firms affiliated with a capital group usually operate on the regional as well as on the national market. Consequently, they face comparatively higher transportation and search costs, the latter originating in the changing structure of the retail and wholesale distribution systems during transition. Following these considerations, we assume that in the investigated period the short-run effects of investment expenditure and transformation-specific influences dominate. Thus, a firm's affiliation with a capital group is expected to have a positive influence on overall production costs.

The "possession of an export licence" indicates whether a company has licences to export meat and meat products into the EU. This variable is assumed to have a positive effect on individual firms' costs for two separate reasons: firstly, an export licence is an indicator of a firm's superior product quality. The ability to meet the sanitary and quality standards required for an EU licence makes it likely that the investment, and subsequently the (fixed) costs of these firms, be above average. Secondly, access to an additional foreign market raises distribution and marketing costs[14].

[14] The average share of products exported to the EU of the total firm's output was relatively small over the investigated period. Regarding the analysed firms, the highest share of those products amounted to less than 2%. Hence, the expected higher output prices of the considered firms reflect primarily higher costs associated with the establishment of firms on the export markets rather than additional foreign demand.

Table 2. **Summary statistics of the exogenous variables of the investigated 45 firms**

	2nd quarter 1991		2nd quarter 1998	
Dummy variables	**Share of firms**			
State owned enterprises (SOE)	78		9	
Privatised	11		84	
by Individual privatisation	2		31	
by Direct privatisation	9		22	
by National Investments Fund	0		31	
Privatisation in process	11		7	
Affiliated with a capital group	0		29	
Possession of an EU export license	0		22	
Continuous variables	**Mean**	**Sd**	**Mean**	**Sd**
Factor prices[a]	–	0.030	–	0.025
Local supply of raw materials	0.117	0.049	0.116	0.091
Regional demand	1.485	0.174	1.434	0.221
Regional market power	0.400	0.203	0.321	0.281
Competitors' costs	0.844	0.021	1.498	0.049

Notes: Sd: standard deviation; [a]: due to its definition, the mean value of the variable "factor prices" equals 1.

Sources: own calculations based on PIS\PAR-database, Boss (1998), individual Annual Reports of meat processing firms and information collected at the Treasury Ministry, Warsaw.

The impact of variable costs is captured by two determinants: "Factor prices" and "Local supply of raw materials". The first one, "Factor prices", represents the meat processors' specific pig purchase prices. Again, we normalised the prices to an average in the period, in order to abstract from common time-specific effects. Corresponding to the comparative statics, higher hog prices will increase product prices.

Driven by the increasing income disparities of Polish consumers, a polarisation of demand towards products of varying quality has been observed. However, supplying different quality needs can only be provided when the farmers receive prices that account for quality differentials. This implies that changing consumer demands have to be converted directly to primary producers and a correlation between the quality of pork and input prices can be expected (Hockmann and Pieniadz, 2002). Nonetheless, our presumption is that the result will differ as far as various outputs are considered: due to differences in the degree of processing and the share of raw materials in the final product, it is likely that quality requirements regarding purchased inputs (livestock/carcasses) will vary among the investigated products. Fresh products (pork chop, pork shoulder) are characterised by a direct relation between the internal attributes of the final products and those of the primary products. Thus, the quality of the slaughter animals sets the benchmark for the attainable quality of the fresh meat. In fact, after primary production, internal quality of pork can only deteriorate

(Ouden *et al*., 1996). Hence, we expect a strong positive correlation between factor prices and output prices for fresh meat. A similar relationship, however somewhat weaker, is likely in the case of highly processed meat products with a high share of raw material (*i.e*., ham, loin). Moreover, because of the close relationship between the input and output qualities, the positive sign of the estimated parameter of the variable "factor prices" can be seen as an indicator that vertical product differentiation matters in the Polish meat market.

The production of high quality sausages requires a corresponding quality of inputs as well. However, harmonising input characteristics to consumer demands takes place largely in the processing stage through mixing (fresh) products, adding additives such as spices, and a firm's specific recipes. In general, high quality sausage products cannot be obtained without at least some minimal quality of raw materials. Thus, if a positive correlation exists, it may not be as significantly reflected in the coefficients as for other products. Furthermore, in this case, horizontal product differentiation might be applied more often than vertical differentiation in order to achieve a better distribution of surplus under changing demand conditions.

A part of the between-firm variation of output prices may also be caused by different access to the resource base or indirectly by differing amounts or quality of pigs raised in the vicinity of a slaughterhouse. These effects are captured by the variable "Local supply of raw materials". The variable is defined as the supply of pigs in the region (*voivodship*) in which a firm is located [15]. It was constructed by splitting annual statistical information about regional pig production homogeneously to the quarters. On the one hand, a sufficient supply of pigs in a given area reduces the transaction and/or transport costs of hog procurement [16]. On the other hand, there is evidence of a positive correlation between the intensity of animal production and the specialisation on high quality animals in a region. Since higher quality is normally awarded with higher output prices, a positive effect of this variable on the output prices is conceivable. Additionally, in regions which specialise in high quality animals, backward integration may allow the firm to obtain better inputs through which it may improve, or at least distinguish, its final products (regional origin). The intention of this variable is to assess empirically which of the counteracting effects dominates.

A further set of variables, $\boldsymbol{c}_{2it}$, is defined to capture the impact of competition on the prices. A first variable, "Regional demand", is used as an indicator of demand size in the region in which a meat processor

[15] In thousands of tons of meat equivalent to a hectare of agricultural area.

[16] Because of the severely fragmentised resource base of hog farming in Poland, transaction costs there might have been higher than in other regions of Poland.

is located. This variable is defined by real wages multiplied by rate of employment within the region, and thus approximates average per capita income in a region. Annual statistical data had to be split into quarters again. It could be argued that this variable is an indicator of a processor's market size. This effect is undoubtedly present. However, the argument neglects the fact that there is plenty of regional meat product trade. Although we observe import and export movements in all regions, the main direction of trade is towards urban centres. Moreover, there is a strong correlation between a region with a high income and its population density. Thus, the higher average income, the more firms are present on the market and the lower the price a firm can charge. We argue that the effect resulting from competition dominates the demand effect [17].

The variable "Regional market power" is also an indicator of regional competition. The degree of concentration on the output markets of the Polish meat processing industry seems to be low at the national level [18]. However, at the regional level, firms can exercise some monopolistic power and hence demand higher prices for their products. This can partly cause the variation of output prices across firms and should also be taken into consideration. Some authors use the distance to each firm's closest rival as a proxy for the degree of competition in the defined regional market area (*e.g.*, Barron *et al.*, 2000). Since there is a great number of firms with different sizes in each *voivodship*, we found it more appropriate to approximate the regional degree of competition or market power by regional market shares. Thus, we define regional market power as a share of highly processed meat products (sausages, ham, other smoked and cured meat) of each firm in total sales (of these products) of the appropriate *voivodship* [19]. Table 2 suggests that the average regional concentration decreased during transition, while the spread between regions increased. These developments reflect major structural changes within Poland in terms of progressing market integration on the one hand, and the structural adaptation of supply to the regional demand condition (market entry and exit) on the other hand. Increasing regional differentiations stress the relevance of this variable by explaining price variations.

[17] Some studies mention (*e.g.*, Wei *et al.*, 1995) that the major share of a meat processing firm's sales go to retailing firms within a vicinity of less than 100 km. Therefore, proximity to urban centres might have been a factor conducive to firms' price setting strategy (Hoteling-model). Hence, regional population density could have been used as an alternative approximation of the regional demand for the products of the firm located within that region. However, we could not utilise this variable because of its very small variation during the investigated period (fixed effect model).

[18] The market price and each firm's profit decrease with the number of firms. When the number of firms becomes very large, the market price tends to the competitive price *c*. Consequently, each firm has only a small influence on the price and thus acts almost like a price taker (Tirole, 1994).

[19] As a denominator, we applied a quarter of the respective annual date.

Thus far, competition is considered through approximations of the absolute and relative market size. However, the model provides that prices are also influenced by costs of a firm's rivals. This effect is captured by "Competitors' costs", which reflects average labour productivity of a firm's rivals. This was constructed by dividing a firm's total quarterly sales in meat equivalents by its labour force. Since labour input at a firm level was only available for 1991 and 1996-1998, we estimated firm-specific series by approximation with a related aggregated time series (Friedman, 1962). For this reason we used annual labour input in the Polish meat processing sector. Our suggestion is that the higher labour productivity of the competitors is, the lower their average costs, and the lower the price a firm can charge. However, the variable is not exogenous in the short run, because a firm's price affects quantities sold and thus labour productivity. This relationship is the reason why we did not consider the variables as the cost determinants of an individual firm. However, it can be expected that the average labour productivity of all competitors is affected less than an individual firms' productivity. Moreover, we had no other variable that could capture the competitiveness of the rivals[20].

Furthermore, as already mentioned, there is a pronounced seasonal pattern in meat consumption so far as, in December, demand for fresh meat and highly processed products in the high price segment is up two times higher than in other months. This development is accompanied by a significant increase in prices (see figure 1). However, we were not able to discover these influences through our estimations. The main reason is that through the transformation of the dependent variable, we erased systematic temporal effects from price adjustments.

REGRESSION RESULTS

The results obtained by fitting equation (6) by error components model with fixed firm-specific effects for 45 firms and 29 quarters from 1991-1998 are given in table 3. The significance of the fixed effects was proved using the Wald test statistics. The hypothesis that the fixed effects are relevant could not be rejected for all products at a 1% level of significance. Furthermore, an adjustment for heteroscedasticity significantly improved the efficiency of the estimates.

In principle, our hypothesis regarding the impact of the different variables on firm gate prices cannot be rejected. The estimates for β_1 and β_2 yielded the expected sign and are highly significant in most

[20] An alternative would be to take concentration measures. Doing this would cause even larger exogeniety problems.

cases. Nevertheless, variables supposed to have an ambivalent effect on output prices, as well as some unexpected results, require additional comments.

Table 3. **Estimated coefficients and standard errors: fixed effect model**

	Product group	FM		PL		PH	
	Product	Pork chop	Pork shoulder	Hard cured sausage	Frankfurter	Cooked ham	Cured loin
	adj. R^2	0.41	0.46	0.42	0.54	0.46	0.47
	F-Statistic	96.7 [10,1172]	121.4 [10,1172]	93.8 [10,1033]	163.4 [10,1172]	120.9 [10,1172]	116.9 [10,1064]
Cost asymetries	Indirect privatisation	-0.025*** (0.007)	-0.020** (0.009)	-0.022** (0.010)	-0.028** (0.011)	-0.038*** (0.008)	-0.039*** (0.009)
	Direct privatisation	-0.003 (0.009)	-0.037*** (0.013)	-0.039*** (0.015)	-0.048*** (0.013)	-0.018** (0.009)	-0.070*** (0.011)
	Mass privatisation	0.022** (0.009)	0.009 (0.008)	-0.012* (0.007)	-0.025*** (0.009)	-0.001 (0.007)	0.003 (0.007)
	Affiliation with a capital group	0.005 (0.008)	-0.018 (0.012)	0.039*** (0.010)	0.034*** (0.013)	0.016** (0.008)	0.041*** (0.011)
	Possession of an export licence	0.009 (0.009)	-0.008 (0.013)	0.021* (0.012)	0.032** (0.013)	-0.007 (0.009)	0.032*** (0.010)
	Factor prices/ hog procurement prices	0.080*** (0.029)	0.167*** (0.054)	0.074 0.046)	-0.062 (0.104)	0.149** (0.073)	0.039** (0.018)
	Local supply of raw materials	0.044 (0.062)	0.049 (0.089)	0.232*** (0.082)	0.198** (0.090)	0.159*** (0.063)	0.291*** (0.073)
Intensity of competition	Regional market power	0.032*** (0.015)	0.049** (0.022)	0.022 (0.020)	0.034* (0.020)	-0.014 (0.014)	-0.015 (0.016)
	Regional demand	-0.062** (0.031)	-0.131*** (0.045)	0.003 (0.041)	-0.012 (0.046)	-0.002 (0.032)	-0.073* (0.037)
	Competitor's costs of labour	0.002 (0.008)	0.023* (0.012)	0.001 (0.012)	0.031*** (0.012)	0.013* (0.007)	0.009 (0.010)

Notes: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Values in round brackets denote standard deviation. The values in square brackets denote degrees of freedom. Maximal number of all cross-sectional and temporal data point without dropped observation: 1,305; number of firms: 45.

Sources: own computations based on PIS\PAR-Database (1998), GUS (various issues a, b, c) and Boss (1998, 1999).

First, regarding cost leadership strategy, firms, which have been privatised by direct and indirect privatisation, are better positioned than others to compete offensively based on prices. A closer look at the values

for direct privatisation reveals that this method has, on average, the highest negative influence on the firm gate price, which can be interpreted as an indicator of superior efficiency gains of its implementation. Conversely, if the firm has been privatised by national investment funds, then there has been no ostensive incentive to achieve lower costs and price levels; at least, no clear effects on the firms' product prices could be identified.

Second, the results support our view that in the investigated period, the short-run effects of investment expenditure dominate. This drives the fixed costs and actual prices of firms affiliated with a capital group, and/or possessing an EU export licence, over the industry average. These findings suggest that in the analysed time period, the firms have first to experience learning curve effects relating to their development and establishment on the markets. Even though these pricing behaviours do not generate competitive cost advantages at present, they can strengthen a firm's market position by putting it in a better position to fend off threats from potential and future rivals.

Third, as expected, the importance of the internal quality of purchased inputs, and hence their prices, vary according to the internal attributes of the final product: an increase in hog procurement prices significantly raises the output prices for fresh products (pork chops and pork shoulder), and for highly processed meat products with a high share of raw materials (ham and loin). One tentative conclusion from these results could be that, with regard to these goods, vertical product differentiation is very likely to be a strategic marketing action to secure customers and hence raise the firms' profitability. Since the production of sausages is a process that inherently leads to a wide range of slightly modified final products, it is not surprising that we found no correlation between input and output prices. In this case, firms can probably find different ways to bypass the use of high-cost raw materials. On the other hand, the internal features of sausages can open up sustainable advantages over rivals, especially when a firm focuses on horizontal product differentiation. In particular, regionally differentiated products can lead to comparative advantages since they could be difficult to match or copy. This would partly explain the significant parameter given by the variable 'local supply' of raw materials, accompanied by insignificant coefficients given by 'factor prices' by sausages.

Fourth, in principle, the influence of the variables indicating the intensity of competition on the Polish meat market corresponds to our assumption as well. However, in this case, product-specific differences can also be observed. Accordingly, prices for fresh pork are negatively affected by regional demand, whereas in the case of highly processed products, hardly any effects could be identified. Furthermore, the estimated coefficients of the variable regional market power were in general positive and significant for low processed goods. This means that in

this market segment, a dominant firm may use its position to charge a mark-up[21]. On the contrary, market-power-based price differences seem to be generally unimportant for processed meat products. The general development of wholesale and retail, increasing scales and shares of supermarket stores and higher durability of highly processed meat products may better regional market integration, and hence counterbalance the local market power of the dominant firms. These findings basically correspond with the estimates regarding variable regional demand, and underline the statements about a low degree of regional integration in the fresh meat market.

Theory suggested a positive relationship between the *i*-th firm's price and competitors' costs. This relationship is principally confirmed by the estimates. However, the significance level of the estimated coefficients is relatively low and refers to only half of the products. It can be concluded that this variable, which reflects average labour productivity of the rivals, does not capture all relevant cost/productivity asymmetries between the firms. Another possible interpretation of these results is that firms which we assume to be potential competitors do not stay in a direct rivalry: on the one hand, the analysis focused on the largest firms in the meat processing industry, which were considered to dominate the Polish market and hence to be able to influence prices. On the other hand, the investigated firms covered only a part of the meat processing establishments and are distributed all over the national market.

In summary, factors influencing a firm's costs and the threat of competition have significantly affected the pricing decisions of firms in the Polish meat market during transition. However, these findings are in no way an answer to all questions about the determinants of price differentials in the analysed market. One limitation concerns the low explanatory power of the analysed variables. Thus, altogether, the investigated individual-time varying variable and the fixed effects capture only 40% to 50% of the total firm-gate price variation while comparing the products (table 3). Several reasons may explain these results. First, since we were unable to observe the firm's and competitor's actual costs, their supposed impact was measured indirectly through the use of proxy-variables. For example, assumed determinants like privatization or affiliation with a capital group had to be modeled using dummy variables, which are only to some extent correlated with the true determinants of price variation, low and high production costs. Hence,

[21] Due to the limited storage possibilities of fresh meat, the existence of an assured market is important to the processors. Because of some shortages in this area on the Polish market, the suppliers of perishable products prefer to sell their products through their own wholesale and retail distribution system or to distribute the products on the local markets to reduce the time /risk of transportation. It is likely that this prevents locally dominant firms from entering distant fresh meat markets.

a relatively low R^2 of the estimated specifications is not surprising. Second, some behaviour patterns relevant in oligopolistic markets are not fully depicted in our empirical model. As already mentioned in the theoretical section, price discrimination could be one of them. Further influences include long-run effects, which manifest themselves in investment behaviour and decisions on market entry and exits. In those areas where profits are high, we can expect market entry, thus the number of firms or market share has to be endogenous in the model and the estimation. It seems to be true that vertical differentiation has already been partly captured by the variables factor prices and local supply of raw materials. However, in view of the fact that the mentioned variables measure only indirect vertical product differentiation, and that a significant influence does not concern all products, the general contribution of this firm's strategy to the unexplained part of the price variation still appears to be relatively high. At the same time, horizontal product differentiation was excluded from the estimation due to the proposition of the theoretical model. However, a firm- and time-specific variation of this omitted variable, even during an economic transition period, is obvious. Additionally, the model had to be kept relatively simple: even though theoretical considerations suggested a non-linear relationship of the price equation, we applied a linear function. This procedure could have further weakened the explanatory power of our empirical model. Finally, the data set is not representative of the Polish meat sector as a whole: small firms are not included and even among the big establishments, the ones that were dropped from the database during the period analysed could have led to estimation bias.

Despite these limitations, the estimation results contribute to filling the gap between theoretical and empirical research, as far as pricing behaviour during transition is considered. Furthermore, our findings are an indirect confirmation of the theoretical considerations, which suggest that in oligopolistic markets, firms follow different marketing strategies (*i.e.*, cost leadership, product differentiation) in order to withstand competitive pressure and hence to raise their economic efficiency[22].

To supplement the above results and to obtain more information regarding the applied marketing strategies among the considered firms, we investigated the estimated fixed effects, as far as they are theoreti-

[22] The analyses also suggest that firms focus on various parallel pricing strategies, which can have short and long run effects. In some cases, low cost producer strategies can even defeat a differentiation strategy, for example, when consumers are satisfied with a standard product and/or are not able to pay for additional product attributes, or otherwise. Further, the preceding considerations demonstrate that the nature of differentiation is hard to quantify, since it corresponds to both subjective (mostly horizontal) and objective (mainly vertical) features of a product.

cally supposed to capture a firm-specific and time invariant part of product differentiation. Table 4 contains some selected test statistics of the estimated parameters. The coefficients are positive for all enterprises and products, and significantly different from zero at the 1% level. The average ranges between 0.864 for cooked ham and 1.043 for cured loin. In the theoretical treatment, we offered two reasons why a positive intercept occurs. The first was pricing in a homogenous good market, and the second was horizontal product differentiation. Competition reduces the size of mark-up a firm can charge above production costs, and thus the mean could be expected to be relatively low. The fact that the mean of the fixed effects are close to one, which is the average product price, can be seen as a sign that horizontal product differentiation is a relevant phenomenon. In addition, the variation of the fixed effects suggests that companies have also incorporated features differentiating products vertically.

Table 4. **Characteristics of the estimated fixed effects**

Product group	FM		PL		PH	
Product	Pork chop	Pig shoulder	Hard cured sausage	Frankfurter	Cooked ham	Cured loin
Mean	0.995	0.964	0.888	1.024	0.864	1.043
Variance	2.36E-03	5.30E-03	4.13E-03	6.77E-03	2.80E-03	4.35E-03
Share on R^2	38.7%	55.5%	70.6%	57.9%	9.9%	8.8%

Source: own computations

Table 4 also provides information on the share of the explained variation from fixed effects on the total explained variation from the model. The results differ strongly among the investigated products. Corresponding to the theoretical treatment, this can be seen as an indicator that possibilities for product differentiation depend on the product itself. However, a part of the vertical product differentiation was supposed to have already been captured by some firm and time variant factors (*i.e.*, factor prices) as far as the FM and PH product groups are considered. Thus, it seems plausible that the explanatory power of fixed effects regarding the PL group is the highest one. Furthermore, the PH group contains products in the high price segment. Their price can already be seen as an indicator for quality, so the possibilities for further vertical product differentiation are rather limited. On the other hand, PL products offer a wide range of attribute variation, which in turn results in a high degree of horizontal product differentiation. The considerations suggest that firms are differently positioned to benefit from special recipes, brand figures, or informative labelling, which confirms and reinforces the tentative preceding conclusions relating to product differentiation.

Table 5. **Between products' correlation of fixed effects**

Product	Pork chop	Pig shoulder	Hard cured sausage	Frankfurter	Cooked ham	Cured loin
Pork chop	1.000	0.556	0.368	0.390	0.498	0.158
Pig shoulder	◊	1.000	0.507	0.185	0.408	0.056[a]
Hard cured sausage	◊	◊	1.000	0.374	0.461	0.214
Frankfurter	◊	◊	◊	1.000	0.384	0.286
Cooked ham	◊	◊	◊	◊	1.000	0.293
Cured loin	◊	◊	◊	◊	◊	1.000

Note: [a]: not significant at a 5% level of significance
Source: own computations

Furthermore, it can be assumed that a firm's pricing behaviour for different product groups is not independent. We checked this hypothesis by calculating the correlation among the fixed effects (table 5). All correlations are positive and, except one, different from zero at 5% level of significance. First of all, this indicates that product differentiation and pricing policies are above all firm specific. However, the results may also suggest some specialisation effects of the processing enterprises, which are not necessarily group-specific.

Generally, the investigation of fixed effects confirms the preceding finding, *i.e.*, that firms follow different strategies to overcome the negative impacts of competing in a homogeneous good industry. However, some limitations should also be considered, *i.e.*, those originating in omitting other relevant firm-specific variables. It can be assumed that such factors as differences in capital costs, applied technology, as well as management skills and efficiency also play a prominent role in explaining the variation of fixed effects. However, it would go beyond the power of the model to explain all sources of their variation.

CONCLUDING REMARKS

Price differentiation is a common feature of oligopolistic markets in food industries. Hence, in spite of the extensive theoretical literature on pricing behaviour, only a few quantitative analyses have been conducted on its reasons and effects, both at the overall level of the agri-food market, and with respect to the individual processing firm. One of the objectives of our paper was to contribute to filling the gap between theoretical considerations and empirical analysis in industrial organisations. Since the backlog is substantial, while taking into account periods of economic transition, we have focused our analyses on the Polish market for pig meat products between 1991-1998. However, the empirical analysis has been confined to surviving companies only.

The theoretical model generated a number of predictions with

respect to the effects of asymmetries in costs among firms on the output price variations. To test these hypotheses, we used a sample of 45 firms considered to be able to influence prices on the Polish meat market during the investigated period. We have chosen products, which represent three different groups of categories: fresh pork (*e.g.*, pork chops), and highly processed pork products with a high (*e.g.*, ham) and low (sausages) share of raw materials.

An error components model with fixed firm-specific effects was fitted and a number of determinants have been identified that have influenced the output prices of individual firms. The estimation results support our hypothesis about the significance of cost asymmetries, and also provide evidence that pricing behaviours differ strongly among firms and through time.

However, our analysis may appear limited due to the low explanatory power of the exogenous variables, which would point to a serious lack in the applied specification. We can follow this argument in such a way that our approximations are rather rough and in some cases may not be well-suited to capture the effect as provided by the theoretical model. However, on the other hand, we argue that the low explanatory power of our empirical model is something we have expected. In the model we looked at prices as a strategic marketing variable, and we considered mainly short-term effects. Other influences concerning long-term effects (*i.e.*, costs relating to investment expenditures) and price discrimination, etc., are only sparingly covered in our empirical application.

Despite some limitations, our analysis contributes to explaining pricing behaviour during transition. The results of our estimation are an indirect confirmation of our expectation, that firms follow different marketing strategies to overcome the intense competition on the Polish meat market. Hence, costs leadership strategies, as well as vertical and horizontal product differentiation, are found to be relevant phenomena in the market under investigation.

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